EXPLANATION OF METHODS USED TO DETERMINE POTENTIAL IMPACTS TO NATURAL RESOURCES FROM THE GRAVINA ACCESS PROJECT OPTIONS

In order to compare Gravina Access Project access options, the potential impacts of each access option on wetlands, marine environment, and essential fish habitat have been determined. The potential impacts outlined in the Screening of Alternatives document are based on consideration of the assumptions outlined below.

Wetlands Impacts

Existing wetlands information is used in determining potential impacts of the Gravina Access Project to wetlands within the project area. The U.S. Fish and Wildlife Service, through the National Wetland Inventory (NWI) mapping program, has prepared broad-scale maps of wetlands in the Ketchikan area. Those maps show that nearly all the lowlands on the Tongass Narrows side of Gravina, as well as most of the land on Pennock Island, is wetland, the only substantial exception being the developed airport area. Additionally, HDR Alaska, Inc. wetlands scientists examined the freshwater wetlands within the Gravina Access Project area in 1999 and 2000 (Leggett 2000). Based on NWI maps and field reconnaissance, forested wetlands, open, "muskeg"-type wetlands, and estuarine meadow wetlands exist on a significant portion of the planning area on Gravina Island.

Presumptions of impacts to palustrine and estuarine wetlands area are calculated from the preliminary design of each access option and NWI mapping. Preliminary engineering has identified a roadway width averaging 39.93 m (131 ft) and roadway length that varies with each option. Wetland impact areas are calculated using the length and width of roadway through mapped wetlands. See Table 1 below.

Table 1. Estimated wetlands area impacted by Gravina Access Project crossing options.

Option	Avg. Roadway Width m (ft)	Length in Palustrine Wetlands m (ft)	Length in Estuarine Wetlands m (ft)	Total Length Through Wetlands m (ft)	Approx. Palustrine Wetland Area Impacted m^2 (acres)	Approx. Estuarine Wetland Area Impacted m^2 (acres)	Approx. Total Wetland Area Impacted m^2 (acres)
A	39.93 (131)	4575 (15010)	112 (366)	4687 (15376)	182682 (45.1)	4454 (1.1)	187136 (46.2)
B	39.93 (131)	3249 (10660)	112 (366)	3361 (11026)	129739 (32.1)	4454 (1.1)	134194 (33.2)
C1	39.93 (131)	710 (2329)	112 (366)	821 (2695)	28345 (7.0)	4454 (1.1)	32800 (8.1)
C2	39.93 (131)	680 (2232)	106 (349)	787 (2581)	27165 (6.7)	4248 (1.0)	31412 (7.8)
C3	39.93 (131)	680 (2232)	106 (349)	787 (2581)	27165 (6.7)	4248 (1.0)	31412 (7.8)
C4	39.93 (131)	680 (2232)	76 (249)	756 (2481)	27165 (6.7)	3030 (0.7)	30195 (7.5)
D1	39.93 (131)	1527 (5009)	0 (0)	1527 (5009)	60963 (15.1)	0 (0)	60963 (15.1)
D2	39.93 (131)	1527 (5009)	0 (0)	1527 (5009)	6063 (15.1)	0 (0)	60963 (15.1)
E1	39.93 (131)	892 (2927)	181 (595)	1074 (3522)	35624 (8.8)	7242 (1.8)	42865 (10.6)
E2	39.93 (131)	678 (2225)	109 (356)	787 (2581)	27080 (6.7)	4333 (1.1)	31412 (7.8)
F1/F3	39.93 (131)	4701 (15424)	77 (251)	4778 (15675)	187720 (46.4)	3055 (0.8)	190775 (47.1)
F2	39.93 (131)	4744 (15564)	59 (195)	4803 (15759)	189424 (46.8)	2373 (0.6)	191797 (47.4)
G1	39.93 (131)	5044 (16548)	145 (477)	5189 (17025)	201400 (49.8)	5805 (1.4)	207206 (51.2)
G2	39.93 (131)	2184 (9135)	17 (57)	2201 (9192)	87207 (27.5)	679(0.2)	87886 (27.7)
G3	39.93 (131)	1126 (3694)	117 (383)	1243 (4077)	44958 (11.1)	4661 (1.2)	49620 (12.3)
G4	39.93 (131)	344 (1129)	0 (0)	344 (1129)	13741 (3.4)	0 (0)	13741 (3.4)

Table 2. Estimated impacts to the marine environment by Gravina Access Project crossing options.

Options	Intertidal Impacts habitat condition/ area impacted (approx. acres)		Subtidal habitat condition/ area impacted (approx. acres)		Eelgrass condition/area impacted (approx. acres)		Summary of Impacts
	Revilla	Gravina	Revilla	Gravina	Revilla	Gravina	
A Site examined Jan 2000	The Refuge Cove area is fairly unimpacted. The lower intertidal has most diverse biota found at any site Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Upper rocky intertidal has rich biota; lower sand/gravel has limited fauna. Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Small amount of sea cucumbers. Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Large amount of cucumbers and large patches of *Laminaria*. Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Small area of eelgrass exists at site. Impacted area: (1 footing partially in eelgrass bed) 81 m^2 (0.02 acres)	No eelgrass observed Jan 2000.	Since this option runs near small islands in Tongass Narrows, more impacts to the intertidal area is expected. Approx. 3562 m^2 (0.88 acres) of undisturbed intertidal habitat impacted. Approx. 3562 m^2 (0.88 acres) of subtidal habitat impacted. Approx. 81 m^2 (0.02 acres) of sparse eelgrass beds impacted. Total impacts to marine environment is approx. 7205 m^2 (1.78 acres).
B Site examined Jan 2000	This area is fairly well developed and consists of a typical armor rock community Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	Undeveloped area; sandy intertidal cove with clams and polychetes. Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	Floatplane dock area is sheltered from winds and waves; *Laminaria* common; little else. Impacted area: (4 pier footings) 3561 m^2 (0.88 acres)	Patchy *Laminaria* and aggregations of cucumbers. Impacted area: (4 pier footings) 3561 m^2 (0.88 acres)	Floatplane dock area is sheltered from winds and waves allowing sparse eelgrass bed to grow. Impacted area (1 footing1/4 in eelgrass bed) 243 m^2 (0.06 acres)	No eelgrass observed Jan 2000.	Approx. 890 m^2 (0.22 acres) of undisturbed intertidal habitat impacted and 890 m^2 (0.22 acres) of armor rock (previously disturbed) intertidal area impacted. Approx. 7122 m^2 (1.76 acres) of subtidal habitat impacted. Approx. 243 m^2 (0.06 acres) of sparse eelgrass bed impacted. Total impacts to marine environment is approx. 9145 m^2 (2.26 acres)
C1 Nearby sites examined	Recently disturbed/ armor rock placed-barren rocks. Impacted area: no pier footings in intertidal.	Disturbed armor rock community. Impacted area: (4 pier footings) 3561 m^2 (0.88 acres)	Debris-disturbed area, some patches of *Laminaria* Impacted area: (4 pier footings) 3561 m^2 (0.88 acres)	Algae beds parallels eelgrass beds; sea cucumbers Impacted area: (5 pier footings) 4452 m^2 (1.10 acres)	No eelgrass	Continuous band of eelgrass. Impacted area: (4 pier footings) 3561 m^2 (0.88 acres)	Approx. 3561 m^2 (0.88 acres) armor rock (previously disturbed) intertidal area impacted. Approx. 8013 m^2 (1.98 acres) of fairly productive (based on underwater surveys) subtidal habitat impacted. Approx. 3561 m^2 (0.88 acres) of dense eelgrass bed impacted. Total impacts to marine environment is approx. 15135 m^2 (3.74 acres).
C2 Site examined Jan 2000	Recently disturbed/ armor rock placed-barren rocks. Impacted area: no pier footings in intertidal.	Disturbed armor rock community Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Debris-disturbed area, some patches of *Laminaria* Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Algae beds parallels eelgrass beds; sea cucumbers Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	No eelgrass	Continuous band of eelgrass. Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Approx. 1781 m^2 (0.44 acres) of armor rock (previously disturbed) intertidal area impacted. Approx. 2671 m^2 (0.66 acres) of subtidal habitat impacted. Approx 1781 m^2 (0.44 acres) of dense eelgrass bed impacted. Total impacts to marine environment is approx. 6233 m^2 (1.54 acres).
C3 Site examined Jan 2000	Recently disturbed/ armor rock placed-barren rocks Impacted area: no pier footings in intertidal.	Disturbed armor rock community Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Debris-disturbed area, some patches of *Laminaria* Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Algae beds parallels eelgrass beds; sea cucumbers Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	No eelgrass	Continuous band of eelgrass. Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Approx. 1781 m^2 (0.44 acres) of armor rock (previously disturbed) intertidal area impacted. Approx. 2671 m^2 (0.66 acres) of subtidal habitat impacted. Approx 1781 m^2 (0.44 acres) of dense eelgrass bed impacted. Total impacts to marine environment is approx. 6233 m^2 (1.54 acres).
C4 Site examined Jan 2000	Recently disturbed/ armor rock placed-barren rocks Impacted area: no pier footings in intertidal.	Disturbed armor rock community Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Debris-disturbed area, some patches of *Laminaria* Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Algae beds parallels eelgrass beds; sea cucumbers Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	No eelgrass	Continuous band of eelgrass. Impacted area: (2 pier footings) 1781 m^2 (0.44 acres)	Approx. 1781 m^2 (0.44 acres) of armor rock (previously disturbed) intertidal area impacted. Approx. 2671 m^2 (0.66 acres) of subtidal habitat impacted. Approx 1781 m^2 (0.44 acres) of dense eelgrass bed impacted. Total impacts to marine environment is approx. 6233 m^2 (1.54 acres).
D1/ D2 Site examined Jan 2000	Recently disturbed/ armor rock placed-barren rocks Impacted area: no pier footings in intertidal.	Disturbed armor rock community. Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	Debris-disturbed area, some patches of *Laminaria* Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	Algae beds parallels eelgrass beds; sea cucumbers Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	No eelgrass	Continues band of eelgrass. Impacted area: (1 pier footing) 890 m^2 (0.22 acres)	Approx. 890 m^2 (0.22 acres) armor rock (previously disturbed) intertidal area impacted. Approx. 1780 m^2 (0.44 acres) of subtidal habitat impacted. Approx. 890 m^2 (0.22 acres) of dense eelgrass bed impacted. Total impacts to marine environment is approx. 3561 m^2 (0.88 acres).
E Site examined Jan 2000	Thomas Basin area; armor rock face of breakwater; "relatively impoverished biota" Impacted area: intertidal area (area of tunnel x avg. length of intertidal) 890 m^2 (0.22 acres)	Site not examined. Fairly unimpacted area. Expect diverse rocky intertidal community Impacted area: intertidal area (area of tunnel x avg. width of intertidal) 890 m^2 (0.22 acres)	Area protected by a breakwater; broken-off pilings show former development in area; *Laminaria* dominates. Impacted area: (tube length x subtidal distance) 44920 m^2 (11.1 acres)	Numerous sunken vessels; much debris; small patches *Laminaria*	Option nears, but does not impact, small patches of eelgrass beds	Small patch of eelgrass Impacted area: (tunnel width x bed width) 40 m^2 (0.01 acres)	Approx. 890 m^2 (0.22 acres) of undisturbed intertidal habitat impacted and 890 m^2 (0.22 acres) armor rock (previously disturbed) intertidal area impacted. Approx. 44920 m^2 (11.1 acres) of subtidal habitat impacted. Approx. 40 m^2 (0.01 acres) of sparse eelgrass bed impacted. Total impacts to marine environment is approx. 46740 m^2 (11.55 acres).
E2	Recently disturbed/ armor rock placed-barren rocks. Impacted area: intertidal area (area of tunnel x avg. length of intertidal) 890 m^2 (0.22 acres)	Disturbed armor rock community. Impacted area: intertidal area (area of tunnel x avg. length of intertidal) 890 m^2 (0.22 acres)	Debris-disturbed area, some patches of *Laminaria* Impacted area: (tube length x subtidal distance) 26992 m^2 (6.67 acres).	Algae beds parallels eelgrass beds; sea cucumbers	No eelgrass	Continuous band of eelgrass. Impacted area: (tunnel width x bed width) 890 m^2 (0.22 acres)	Approx. 1780 m^2 (0.44 acres) of armor rock (previously disturbed) intertidal area impacted. Approx. 26992 m^2 (6.67 acres) of subtidal habitat impacted. Approx. 890 m^2 (0.22 acres) of eelgrass bed impacted. Total impacts to marine environment is approx. 29662 m^2 (7.33 acres).

Options	Intertidal Impacts habitat condition/ area impacted (approx. acres)		Subtidal habitat condition/ area impacted (approx. acres)		Eelgrass condition/area impacted (approx. acres)		Summary of Impacts
	Revilla	Gravina	Revilla	Gravina	Revilla	Gravina	
G1 Site examined Jan 2000	The Refuge Cove area is fairly unimpacted. The lower intertidal has most diverse biota found at any site. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Upper rocky intertidal has rich biota; lower sand/gravel has limited fauna. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Small amount of sea cucumbers. Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Large amount of cucumbers and large patches of *Laminaria*. Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Small area of eelgrass exists at site. Impacted area: (ferry terminal length within eelgrass bed) 647 m^2 (0.16 acres)	No eelgrass observed Jan 2000.	Approx. 4208 m^2 (1.04 acres) of undisturbed intertidal habitat impacted. Approx. 1214 m^2 (0.30 acres) of subtidal habitat impacted. Approx. 647 m^2 (0.16 acres) of sparse eelgrass beds impacted. Total impacts to marine environment is approx. 6069 m^2 (1.50 acres).
G2 Site not examined	Likely to be developed area within typical armor rock community depending on where rock is placed. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Fairly undeveloped area. Expect diverse rocky intertidal community. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Developed area; likely disturbed community. Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Expect that *Laminaria* and sea cucumbers inhabit location Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Unknown	Unknown	The marine habitat in the area of this option has not been investigated. Estimate that approx. 2104 m^2 (0.52 acres) of undisturbed intertidal habitat impacted and 2104 m^2 (0.52 acres) armor rock (previously disturbed) intertidal area impacted. Approx. 1214 m^2 (0.30 acres) of subtidal habitat impacted. It is not known whether this option will impact eelgrass beds. Total impacts to marine environment is approx. 5422 m^2 (1.34 acres).
G3 Site examined Jan 2000	Thomas Basin area; armor rock face of breakwater; relatively impoverished biota. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Site not examined Fairly unimpacted area. Expect diverse rocky intertidal community. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Area protected by a breakwater; broken-off pilings show former development in area; *Laminaria* dominates. Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Numerous sunken vessels; much debris; small patches *Laminaria* Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Small patches of eelgrass beds nearby. Option will avoid.	Small patches of eelgrass beds nearby. Option will avoid.	Approx. 2104 m^2 (0.52 acres) of undisturbed intertidal habitat impacted and 2104 m^2 (0.52 acres) armor rock (previously disturbed) intertidal area impacted. Approx. 1214 m^2 (0.30 acres) of subtidal habitat impacted. Eelgrass beds are avoided. Total impacts to marine environment is approx. 5422 m^2 (1.34 acres).
G4 Site not examined	Developed area; expect typical armor rock community; less diverse and abundant habitat. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Developed area; expect typical armor rock community; less diverse and abundant habitat. Impacted area: (ferry terminal length within the intertidal area) 2104 m^2 (0.52 acres)	Developed area; less diverse and abundant habitat. Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	Developed area; less diverse and abundant habitat. Impacted area : (ferry terminal length within the subtidal area) 607 m^2 (0.15 acres)	No eelgrass expected in area.	Continuous band of eelgrass. Area (ferry terminal length through eelgrass bed) 647 m^2 (0.16 acres).	Approx. 4208 m^2 (1.04 acres) armor rock (previously disturbed) intertidal area impacted. Approx. 1214 m^2 (0.30 acres) of subtidal habitat impacted. Approx. 647 m^2 (0.16 acres) eelgrass beds impacted. Total impacts to marine environment is approx. 6069 m^2 (1.50 acres).

Options	Intertidal Impacts habitat condition/ area impacted (acres)			Subtidal habitat condition/ area impacted (acres)			Eelgrass condition/area impacted (acres)			Summary of Impacts
	Revilla	Pennock	Gravina	Revilla	Pennock	Gravina	Revilla	Pennock	Gravina	
F1/ F1 Cable stayed. Site examined	Former dump area; much debris; healthy rockweed higher elevations; less abundant biota lower. Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	East: typical community; unimpacted. West: diverse and prolific community Impacted area: East: (1 pier footing) 890 m^2 (0.22 acres). West: (1 pier footing) 890 m^2 (0.22 acres).	Diverse habitat with moderately high densities of organisms. Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	Garbage and metal debris litter bottom; continuous mat of *Laminaria*. Area: (3 pier footings) 2671 m^2 (0.66 acres).	East: Extensive Laminaria bed West: Scouring due to strong currents; laminaria beds.	Sunken tugboat in area; small patches of algae	No eelgrass observed.	No eelgrass observed.	No eelgrass observed	Approx. 2670 m^2 (0.66 acres) of undisturbed intertidal habitat impacted and 890 m^2 (0.22acres) previously disturbed intertidal area impacted. Approx. 2671 m^2 (0.66 acres) of subtidal habitat impacted. Eelgrass beds are avoided. Total impacts to marine environment is approx. 6231 m^2 (1.54 acres).
F2 Site examined Jan 2000	Former dump area; much debris; healthy rockweed higher elevations; less abundant biota lower. Impacted area: (area of tunnel x avg. length of intertidal) 890 m^2 (0.22 acres)	East: typical community; unimpacted. West: diverse and prolific community. Impacted area: East: (intertidal area x area of tunnel) 81 m^2 (0.02 acres) West: (1 pier footing) 890 m^2 (0.22 acres)	Diverse habitat with moderately high densities of organisms. Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	Garbage and metal debris litter bottom; continuous mat of *Laminaria*. Impacted area: (tunnel length x subtidal distance) 31444 m^2 (7.77 acres).	East: Extensive Laminaria bed West: Scouring due to strong currents; laminaria beds; some debris seen.	Sunken tugboat in area; small patches of algae	No eelgrass observed.	No eelgrass observed.	Small area of eelgrass Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	Approx. 1861 m^2 (0.45 acres) of undisturbed intertidal habitat impacted and 890 m^2 (0.22 acres) previously disturbed intertidal area impacted. Approx. 31444 m^2 (7.77 acres) of subtidal habitat impacted. Approx. 890 m^2 (0.22 acres) of a sparse eelgrass bed impacted. Total impacts to marine environment is approx. 35085 m^2 (8.67 acres).
F3 Site examined Jan 2000	Former dump area; much debris; healthy rockweed higher elevations; less abundant biota lower. Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	East: typical community; unimpacted. West: diverse and prolific community Area: East: (1 pier footing) 890 m^2 (0.22 acres) West: (1 pier footing) 890 m^2 (0.22 acres).	Diverse habitat with moderately high densities of organisms Impacted area: (1 pier footing) 890 m^2 (0.22 acres).	Garbage and metal debris litter bottom; continuous mat of *Laminaria*. Area: (3 pier footings) 2671 m^2 (0.66 acres)	East: Extensive Laminaria bed West: Scouring due to strong currents; *Laminaria* beds.	Sunken tugboat in area; small patches of algae	No eelgrass observed.	No eelgrass observed.	No eelgrass observed	Approx. 2670 m^2 (0.66 acres) of undisturbed intertidal habitat impacted and 890 m^2 (0.22 acres) previously disturbed intertidal area impacted. Approx. 2671 m^2 (0.66 acres) of subtidal habitat impacted. Eelgrass beds are avoided. Total impacts to marine environment is approx. 6231 m^2 (1.54 acres).

Marine Environment Impacts

Biological information regarding each intertidal and subtidal site is based on the Gravina Access Project Phase I Marine Reconnaissance Report prepared for HDR Alaska, Inc. by Pentec Environmental in March 2000. The report, founded on intertidal and subtidal field investigations completed in January 2000, has data on every site under consideration with the exception of sites where G2 and G4 make landfall on both Gravina and Revilla Islands. Characteristics described in the report include general habitat types, species assemblages and densities, and the existence and extent of human development.

Presumptions of impacted marine areas are calculated from the findings of the marine report and the preliminary design of each access option. Calculations of impacts to the intertidal habitat are based on an average intertidal zone of approximately 15 m (49.2 ft) wide in the project area. Potential subtidal and intertidal impact areas from the ferry are determined using the approximate area that is currently impacted by the existing airport ferry (including the parking lot, walking ramp, and docking area). The bridge, tunnel, and road impact areas are founded on the average width of each option specified in preliminary design. The impact area of each access option was measured from preliminary design drawings.

Additionally, an explanation of the condition of the intertidal habitat and eelgrass beds is reported based of the findings of the intertidal and subtidal field effort and data analysis. Table 2 gives a description of the marine habitat that could be impacted and the approximate impact area.

Essential Fish Habitat Impacts

In 1996, the Sustainable Fisheries Act amended the Magnusson-Stevens Fisheries Conservation and Management Act to address impacts to essential fish habitat (EFH) by Federal actions. The Act now requires that the Federal agencies consult with and respond to comments and recommendations made by the National Marine Fisheries Service (NMFS) on Federal projects.

Essential fish habitat includes those waters and substrate that are necessary to NMFS managed fish for spawning, breeding, feeding, or growth to maturity. This includes ocean waters that have been mapped by the NMFS as important for particular marine species and anadromous streams important for salmonids. Additionally, freshwater riparian (or riverine) and estuarine wetlands that support salmonid spawning and rearing are considered EFH by NMFS.

Based on preliminary information from NMFS, it is assumed that all intertidal and subtidal waters, estuarine wetlands, and anadromous streams in the Gravina Access Project area are EFH for some fish species. Riparian wetlands may occur in the project area and provide EFH; however, best available information at this stage of the analysis (i.e., NWI maps) do not indicate riparian wetlands within the proposed alternative corridors. Riparian wetlands will be added to calculations of EFH once the those wetlands are delineated within the project area. Marine waters were investigated and reported on in the Gravina Access Project Phase I Marine Reconnaissance Report

prepared for HDR Alaska, Inc. by Pentec Environmental in March 2000. Estuarine wetlands area was determined from NWI mapping. Information on anadromous streams was derived from Alaska Department of Fish and Game mapping conducted on anadromous streams on Gravina and Revilla islands.

Impacted area is calculated from the preliminary design of each access option. Potential subtidal and intertidal and estuarine wetland impact areas of a ferry are determined using the approximate area that is currently impacted by the existing airport ferry (including the parking lot, walking ramp, and docking area). The bridge, tunnel, and road impact areas are founded on average width of each option [39.93 meters (131 ft)] through areas considered EFH. Impacts to EFH included in anadromous streams are based on the number of streams crossed, the average width of the streams [approx. 4.6 meters (15 feet)], and the average roadway width that would cross the streams [39.93 meters (131 ft)]. See Table 3 below.

Table 3. Total estimated essential fish habitat (EFH) impacted by Gravina Access Project crossing options.

Option	Number of Streams	Average Stream Width m (ft)	Average Roadway Width m (ft)	Anadromous Stream Area Impacted m^2 (acres)	Estuarine Wetland Area Impacted m^2 (acres)	Marine Area Impacted m^2 (acres)	Total EFH Impacted m^2 (acres)
A	2	4.57 (15)	39.93 (131)	365 (0.09)	4454 (1.1)	7205 (1.78)	12024 (2.97)
B	2	4.57 (15)	39.93 (131)	365 (0.09)	4454 (1.1)	9145 (2.26)	13964 (3.45)
C1	0	4.57 (15)	39.93 (131)	0 (0.00)	4454 (1.1)	15135 (3.75)	119589 (4.84)
C2	0	4.57 (15)	39.93 (131)	0 (0.00)	4248 (1.0)	4451.59 (1.10)	10481 (2.54)
C3	0	4.57 (15)	39.93 (131)	0 (0.00)	4248 (1.0)	6233 (1.54)	10481 (2.54)
C4	0	4.57 (15)	39.93 (131)	0 (0.00)	3030 (0.7)	6233 (1.54)	9263 (2.24)
D1	0	4.57 (15)	39.93 (131)	0 (0.00)	0 (0.00)	3561 (0.88)	3561 (0.88)
D2	0	4.57 (15)	39.93 (131)	0 (0.00)	0 (0.00)	3561 (0.88)	3561 (0.88)
E	0	4.57 (15)	39.93 (131)	0 (0.00)	7242 (1.8)	46740 (11.55)	53982 (13.35)
E2	0	4.57 (15)	39.93 (131)	0 (0.00)	4333 (1.1)	29662 (7.33)	33995 (8.43)
F1/F3	2	4.57 (15)	39.93 (131)	365 (0.09)	3055 (0.8)	6231 (1.54)	9651 (2.43)
F2	2	4.57 (15)	39.93 (131)	365 (0.09)	2373 (0.6)	35085 (8.67)	37823 (9.36)
G1	2	4.57 (15)	39.93 (131)	365 (0.09)	5805 (1.4)	6069 (1.50)	12239 (2.99)
G2	2	4.57 (15)	39.93 (131)	365 (0.09)	679 (0.2)	5422 (1.34)	6466 (1.63)
G3	1	4.57 (15)	39.93 (131)	182 (0.05)	4661 (1.2)	5422 (1.34)	10266 (2.59)
G4	0	4.57 (15)	39.93 (131)	0 (0.00)	0 (0.00)	6069 (1.50)	6069 (1.50)